INTEGRATED SYSTEM EVALUATION PLANNING OVERVIEW

April 2010

TEMAC T&E Refresher Course

Outline

- Introduction
- Value of T&E
- Integrated System Evaluation Strategy Formulation
  - Capabilities Analysis
  - Data Management
  - Experimental Design & Analysis of Data
  - Data Set Design
- Documenting the System Evaluation Strategy
- Summary

Introduction

T&E Philosophy

- Move Programs Forward → Testing helps development
- Reduce Risk to Soldiers (by ensuring ESS)
- Army's Honest Broker →

Give every system a chance to succeed

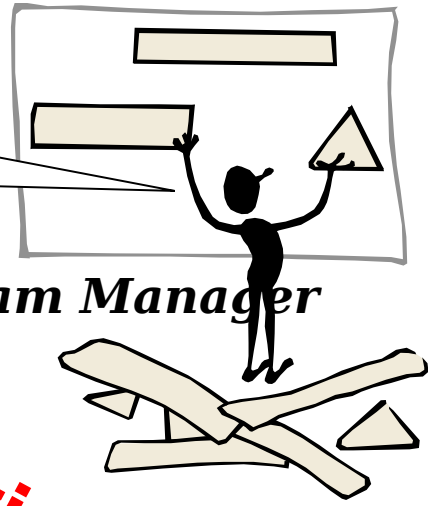
- Test to Learn; Evaluate to Understand
- Evaluation in Depth: Box → Platform → Unit Mission →
- No Pass / Fail → Capabilities and Limitations
- Provide Info to Decision Makers

Good Enough ≠ Anything will do

Supporting the Soldier

"This is what I need"

"This is what I built"



Program Manager

Combat Developer/ Functional Proponent

Requirements

Acquisition

Enhanced Mission Capabi

"This is how well it works"

Test and Evaluation

Effective
Suitable
Survivable

Tester & Evaluator

Evaluation Focus

- What are the System, Warfighting, and Mission Capabilities that need to be addressed?
- Why are these important and how are they related?
- What needs to be measured?
- Under what conditions do you want to measure it?

"System" = Equipment

"System" = Soldiers in Units with the Equipment and support, conducting their missions

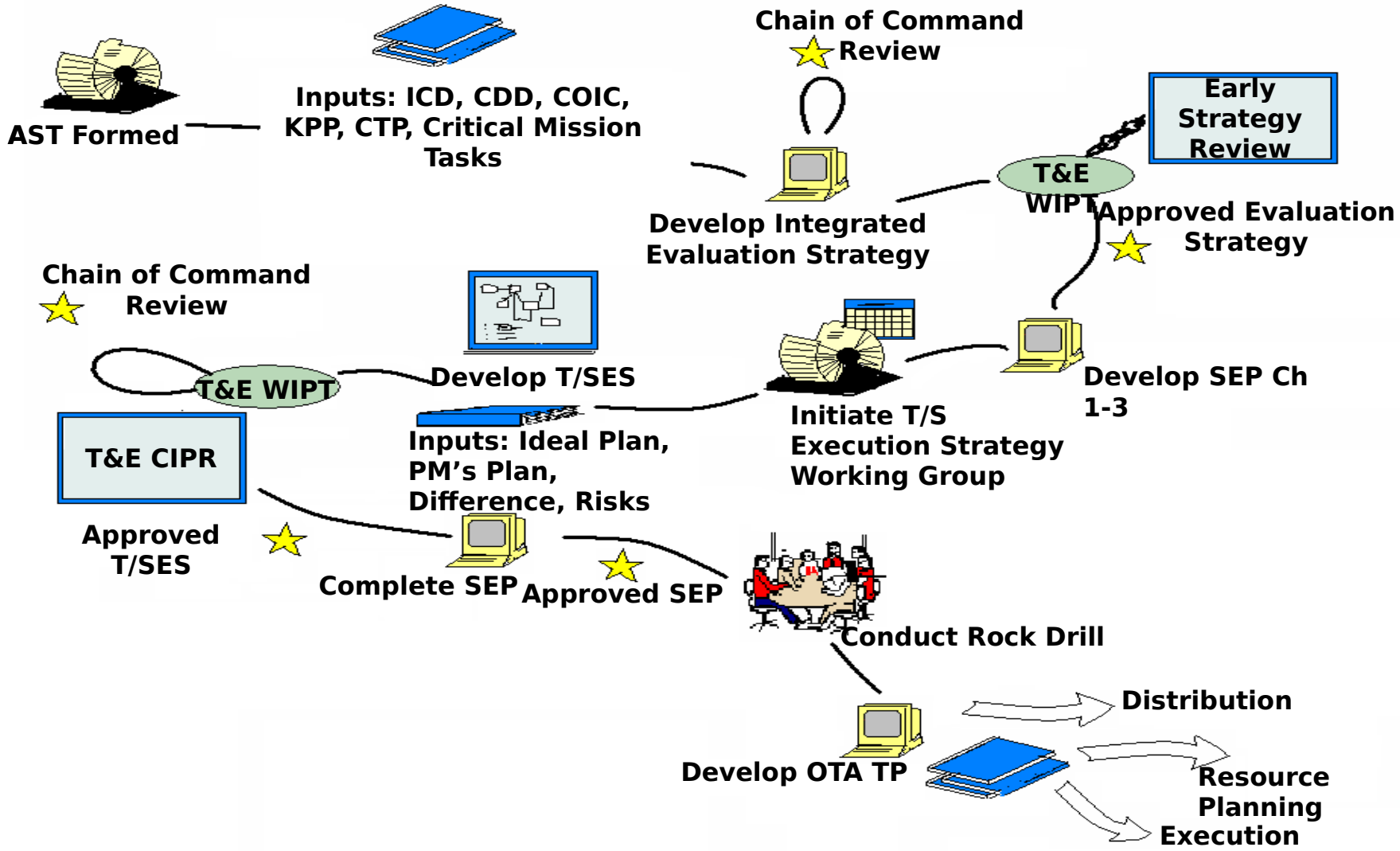
Mission: Assess Operational Readiness

MATERIEL RELEASE

- Full (FMR)
- Conditional
- Follow-on Conditional
- Interim
- Conversion from Conditional to Full
- Training
- Urgent (UMR)
- Readiness Issue for Certification

C&L Report: Capabilities and Limitations Report
OAR: Operational Test Activity Assessment Report
OER: Operational Test Activity Evaluation Report
SEP: System Evaluation Plan
TIR: Test Incident Report

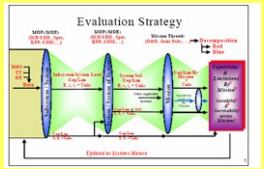
ATEC's T&E Planning Process



System Evaluation Process

AEC

Lens Chart



ESR

CIRR

SEP

DT

LF

R

Log

OT

PM

Contr

Simulation

Training Event

Test Reports

Simulation

Data

Assessment

Multi-Services

CASCOM

SLAD

HRED

SDDC

TRAC

TRADOC

ATEC OER/ OMAR

PM

TSM

ASA- FM

G1, 4

DOTE

MDA

Strategy

Test Events

Data

Evaluation

Reporting

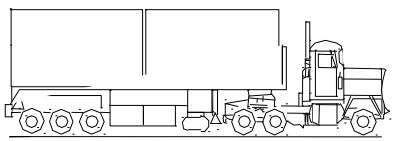
Any Decision

Early Evaluation Tasks

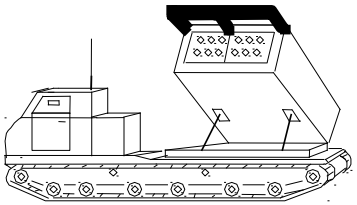
- Ensure T&E is considered in the RFP, SOW, and System Requirements, particularly access to test data and adequacy of testing.
- Verify the linkage between requirements in the ICD, RFP, and Proposals
- Ensure AST members understand how the system will be used and its expected capabilities
- Begin formulation of the evaluation strategy
- Visualize the system in the hands of the user
- Identify inter- and intra-dependent systems
- Become familiar with the warfighting system

Evaluation Strategy Review: 180 Days after AST Formed

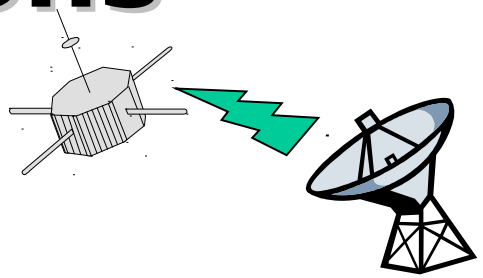
Evaluation Considerations



Logistics



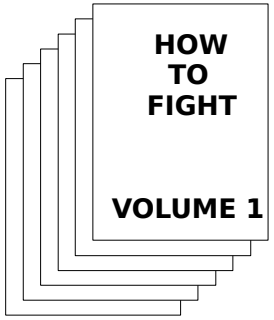
Hardware



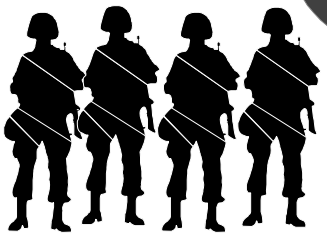
Interoperability

Warfighting System

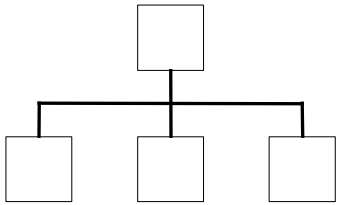
Software



Tactics, Techniques, & Procedures



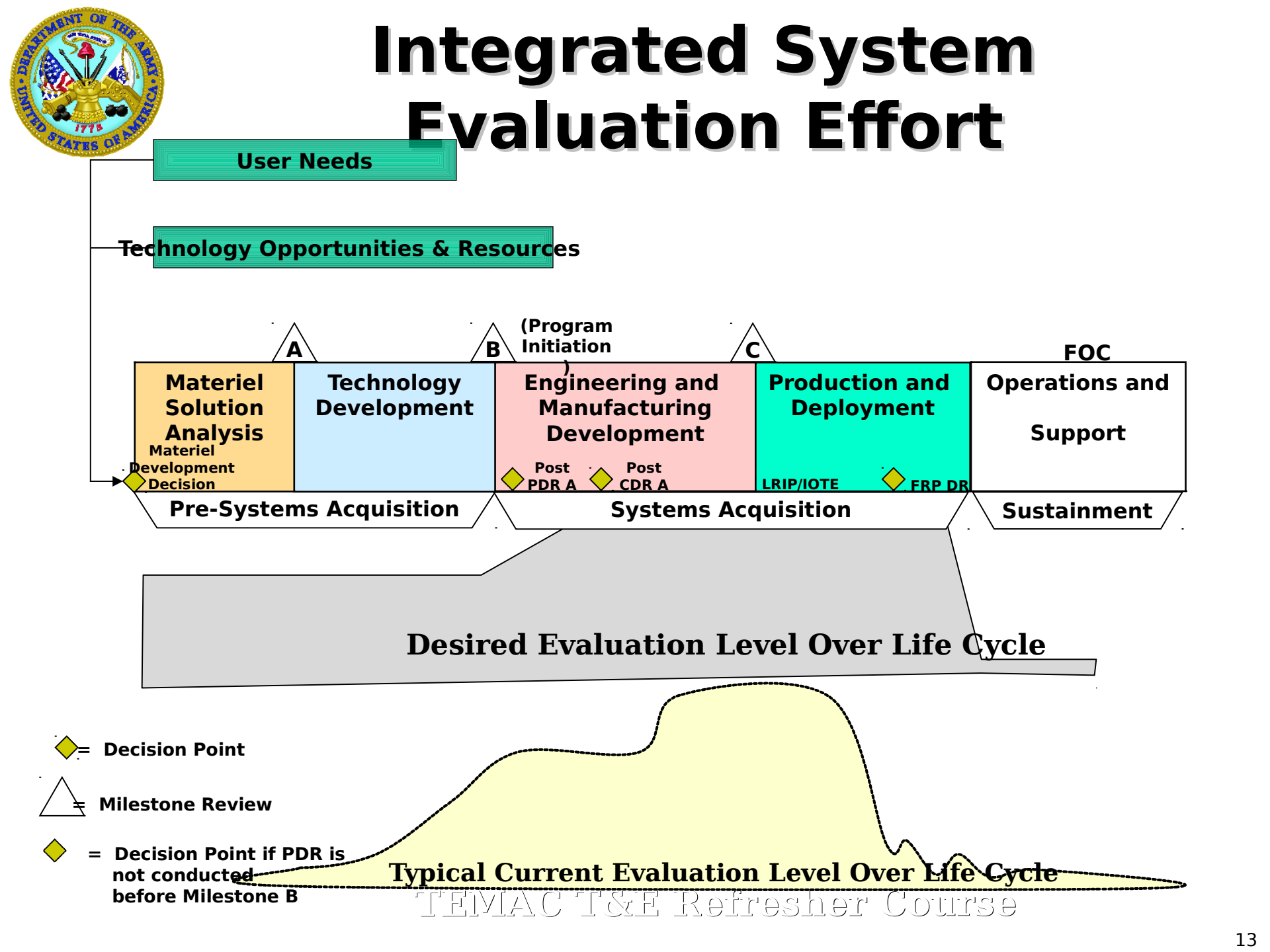
Training



Organization and Tasks

Value of Integrated System Evaluation

Integrated System Evaluation Effort



Developmental Testing New Paradigm

$$DT_{Optimized} \int_{2009}^{2018} (CT, GT, Exp., Analysis, LFT\&E, M\&$$

To Minimize Acquisition Cycle Time, the Army Must Optimize Developmental Testing

"Primary T&E Purpose is to Demonstrate a System Works"

T&E Value
Materiel Solution Analysis & Technology Development Phases

- **Key Evaluation Support Objective**
  - **Involvement in development of user requirements**
  - **Assist acquisition community in “risk reduction” through accurate and timely system evaluations**
  - **Early identification of system potential and Military Utility**
- **Key Evaluation Support Contributions**
  - **Develop integrated system evaluation strategy early**
  - **Assist in TEMP development**
  - **Provide evaluator expertise to CBTDEV / MATDEV studies & analyses**
  - **Develop evaluation plans for ACTD/ATD/TD demonstrations & AWE experiments**
  - **Provide quick evaluation on rapid acquisition initiative candidates**
  - **Perform early system assessm ct of technical approaches**

Early evaluator involvement reduces risk regarding requirements, technology, and schedule

T&E Value Engineering and Manufacturing Development Phase

- **Key Evaluation Support Objective**
  - **Optimize evaluations scope and data requirements to**
  - **support Acquisition Strategy**
  - **Provide decision makers with identification of**
  - **system performance areas of risk**
  - **Execute corrective action process**
  - **Support LRIP decisions**
  - **Assist in posturing system for successful OTs**

- **Key Evaluation Support Contributions**
  - **Lead DT and OT input to the TEMP**
  - **Develop System Evaluation Plan (SEP)**
  - **Witness and/or monitor contractor conducted**
  - **Provide periodic assessments on system demonstrated performance**
  - **Assist in identification of system requirements that need refinement**
  - **Assess reliability; survivability, vulnerability, and logistics supportability; system capability, interoperability, and integration capability**

Significant evaluation effort contributes to…
- Assessment of contractor tests and DT
- Risk reduction before entering IOT

Value of T&E
Production & Deployment Phase

- Key Evaluation Support Objective
  - Provide system evaluations that accurately reflect system maturity and performance capability prior to full-rate production decision
  - Quick Look Assessment Report
  - Support the Materiel Release process

- Key Evaluation Support Contributions
  - Conduct system evaluations to estimate mission effectiveness, suitability, and survivability
  - Evaluate changes in production configuration
  - Identify needed changes to logistics support and TTPs

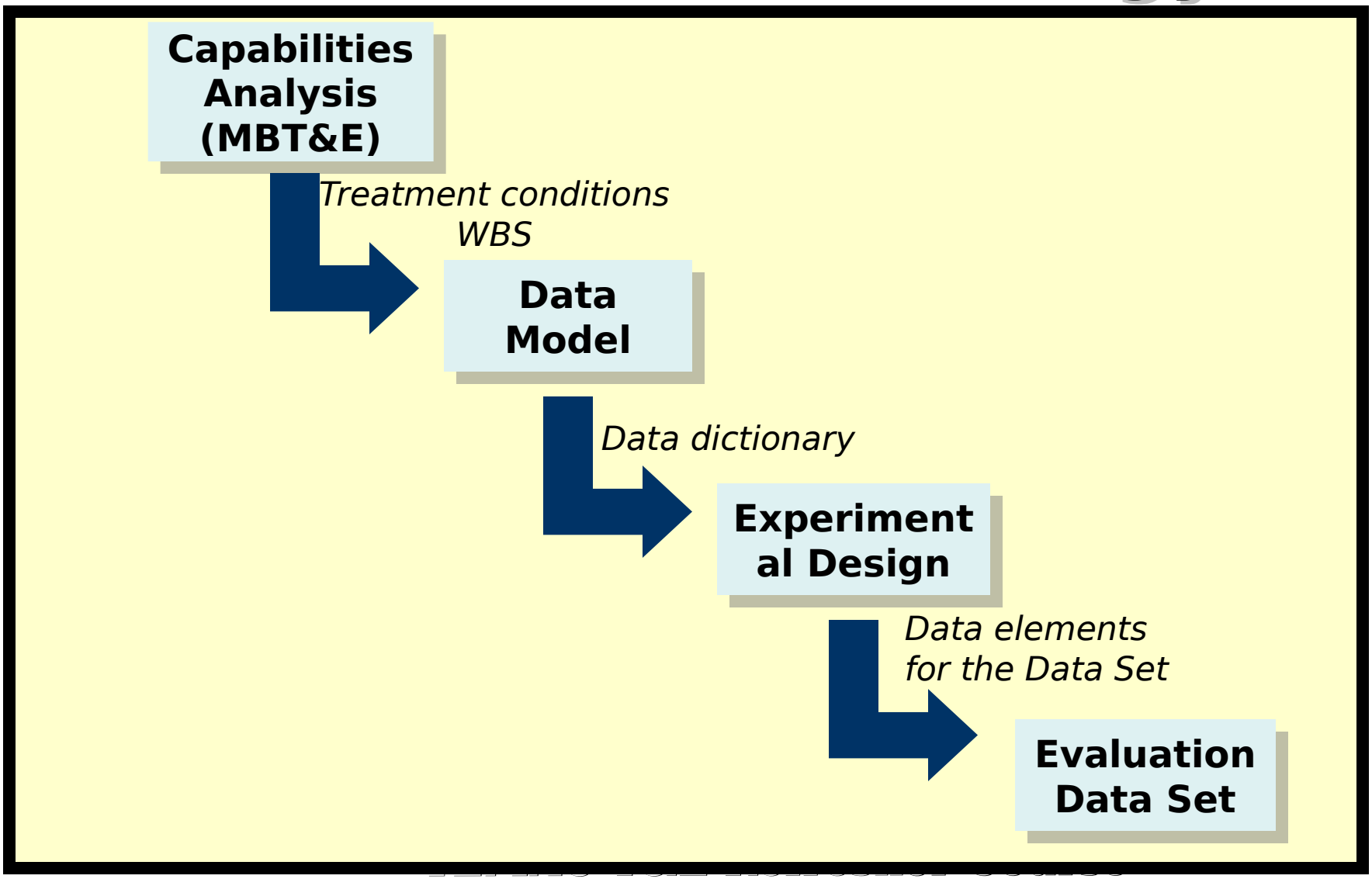
T&E Value
Operations & Support Phase

- Key Evaluation Support Objective
  - Provide evaluation of system performance resulting from increment changes, P3I, or operations in deployed units to determine full operational capability

- Key Evaluation Support Contributions
  - Conduct system assessment(s) to support Materiel Release
  - Monitor production acceptance testing and evaluate results
  - Assist CBTDEV in identifying and developing changes to system requirements

Integrated System Evaluation Strategy Formulation

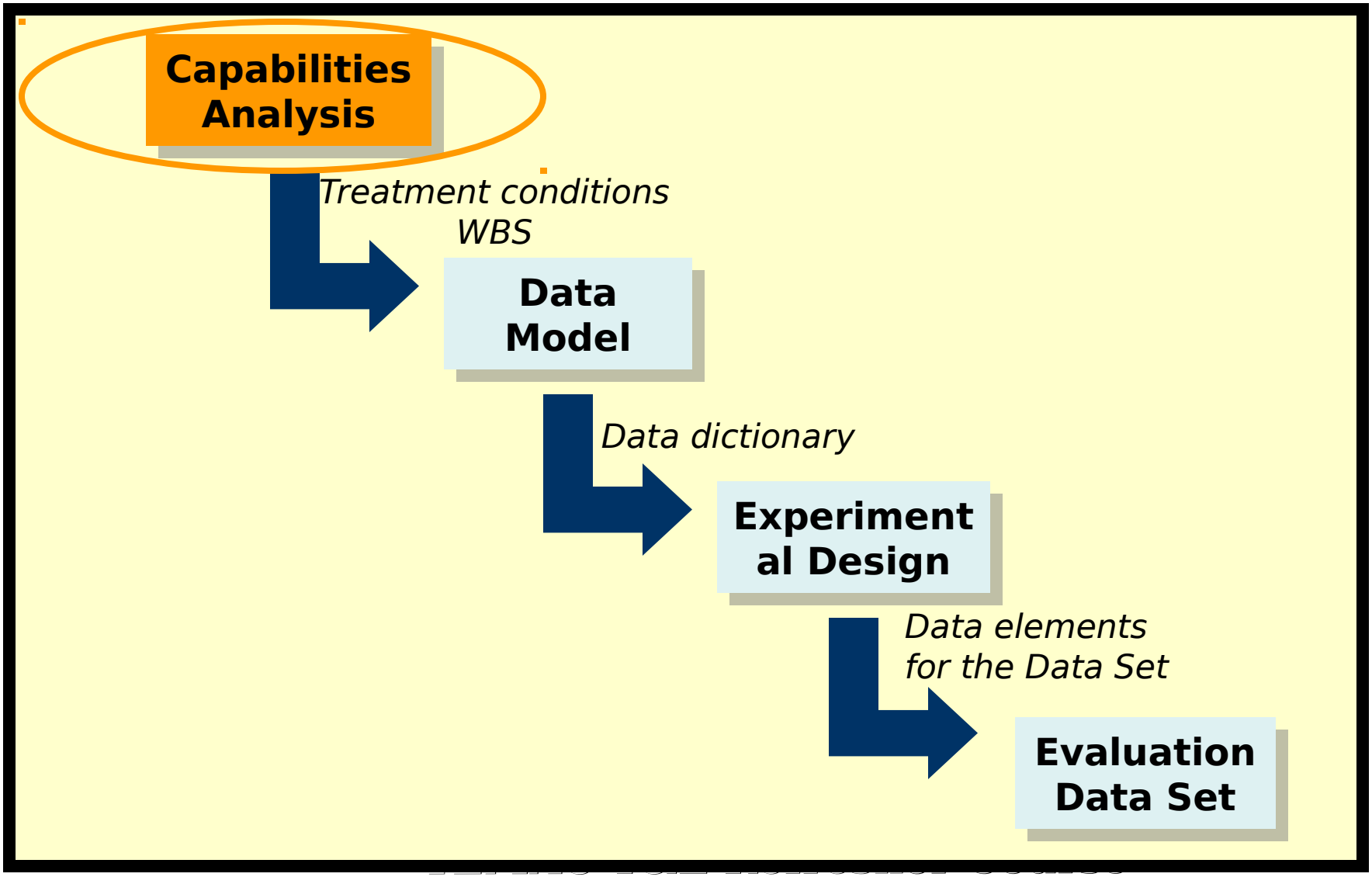
Essential Elements of the Evaluation Strategy



Essential Elements of the Evaluation Strategy

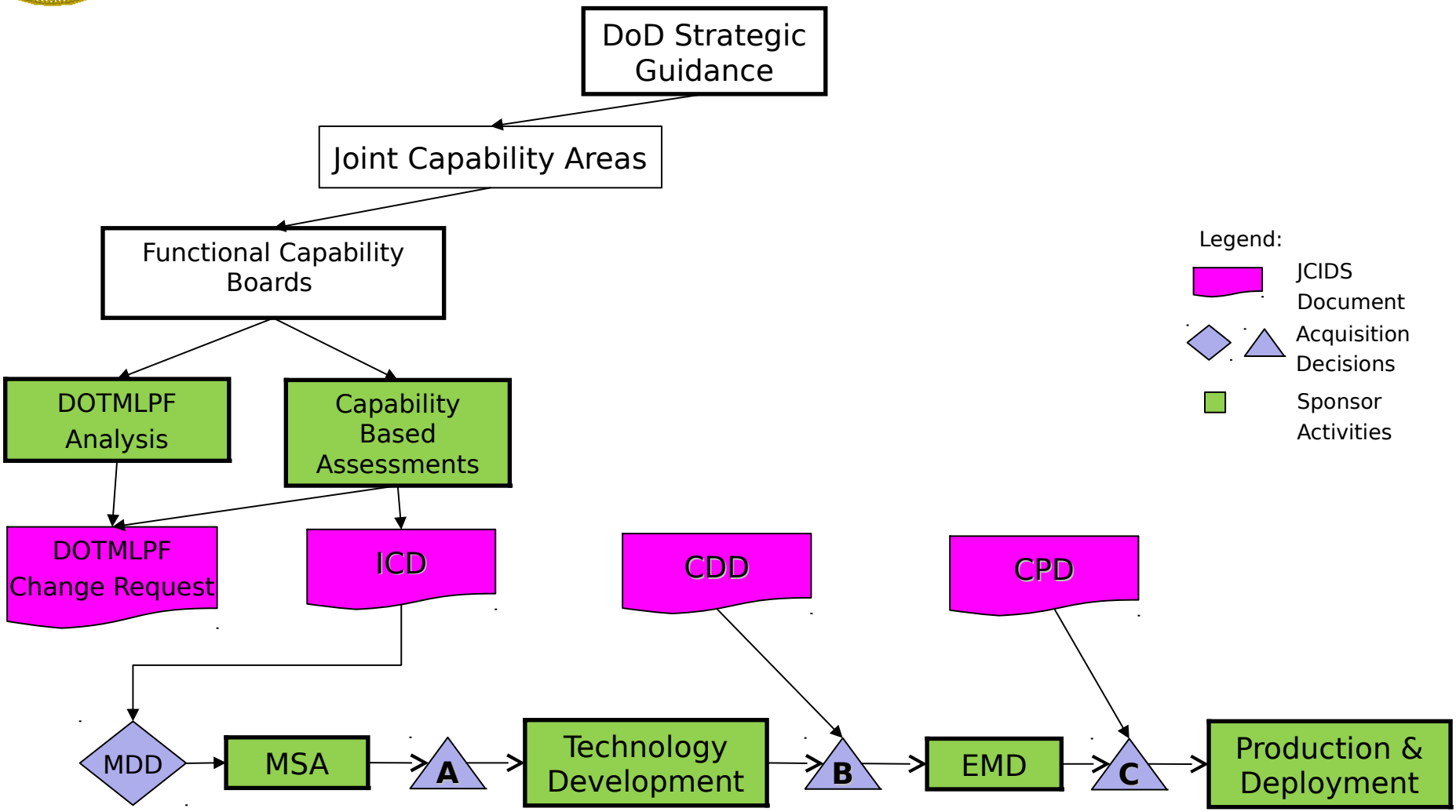
- Evaluation Strategy is defined as a plan of action in which:
  - ***Capabilities Analysis*** is performed
  - ***Data Model*** is produced
  - ***Experimental Design*** is created
  - ***Evaluation Data Sets*** are produced
  - ***Data Sources*** are identified

Essential Elements of the Evaluation Strategy



Capabilities Analysis

Joint Capabilities Process and Acquisition Decisions



Capability (CJCSI 3170.01)

- **Ability to execute a specified course of action.**
- **Defined by an operational user and expressed in broad operational terms in the format of an initial capabilities document or a DOTMLPF change recommendation.**
- **In the case of material proposals, the definition will progressively evolve to DOTMLPF performance attributes identified in the CDD and the CPD.**

Capability-Based Evaluation

ATEC REG 73-1

ATEC will evaluate systems by determining capabilities and limitations at multiple levels of complexity (lenses) starting with the individual system or its major sub-systems and culminating with an evaluation of the contribution of the system to the unit missions

Understanding Capability

- System Capabilities must be understood in context of the Unit Mission, Warfighting Function Tasks and System Attributes. Use the ICD, CDD, and CPD. Possible examples:
  - ***Mission:*** The capabilities to successfully accomplish mission operations (e.g. Deliberate Attack, Ambush, Defend in Sector, Stability and Security).
  - ***Warfighting Function Tasks:*** The unit capabilities to accomplish Warfighting Function Tasks which contribute to mission operations(e.g. provide intelligence support to weapons effects, execute mission planning, conduct indirect fire).
  - ***System:*** The system attributes needed to successfully accomplish system functions which contribute to Warfighting Function Tasks (e.g. detect, locate, and identify SIGINT emitters within the corps area of interest).

Warfighting Functions

- Major functions performed by the force on the battlefield to successfully execute Army operations (battles and engagements). The warfighting functions are the means by which Army forces accomplish missions. They include:
  - **Movement & Maneuver**
  - **Intelligence**
  - **Fires**
  - **Sustainment**
  - **Command and Control**
  - **Protection (to include CBRNE defense)**

Independent of Battlefield Organizational Structure

Capability-Based Evaluation Objectives

- Engineering and Manufacturing Development Phase
  - Ensure that the system ***hardware*** and ***software*** works
  - Ensure that the system design is technically sound with respect to its ***interoperability, suitability, and survivability***
  - Ensure that the ***soldier is integrated*** into the system, and the ***system is integrated*** into the unit as early as possible
  - Project the potential impacts of the system's capability and limitations on its Battlefield Functional Area
  - ***Prior*** to Initial Operational Test (IOT) ensure that all critical problems are identified, corrected, and demonstrated and that the total warfighting system is ready for IOT
  - Minimize the ***risks*** in transitioning the system from development to fielding
- Production and Deployment Phase
  - Evaluate the system's effectiveness, suitability, and survivability
  - Evaluate the ***contribution*** of the system to enhancing and sustaining Warfighting Function Areas and Mission Capability

Capabilities Analysis

- **Identifies the system's issues, functions, measures, and performance conditions**
- **System issues and measures**
  - **Found in the KPPs, COICS and AIs**
  - **Specify the system's functions (independent or nuisance variables) and expected performance conditions (dependent variables)**
- **Evaluation functional areas**
  - **Include Effectiveness, Survivability, and Suitability (ESS)**
  - **System's tasks found in:**
    - **CJCSM 3500.04C, Universal Joint Task List (UJTL)**
    - **FM 7-15, Army Universal Task List (AUTL)**
    - **Mission Training Plan manuals**
  - **System's operating procedures found in Operational Mode Summary / Mission Profile**

How Do You Do a Capabilities Analysis?

DoD 5000 Directive & Instruction
Defense Acquisition Guidebook

Capabilities:
COIC, AOI
CDD, CPD (KPPs, OMS/MP)
STAR
Architecture

Measures
AUTL, Other

Review Documentation

Identify and organize mission needs, analyze measures.

Products:

- Factors & Conditions
- Functional Dendritic (ESS)
- Lens Chart
- Pattern of Analysis

Evaluator Tester

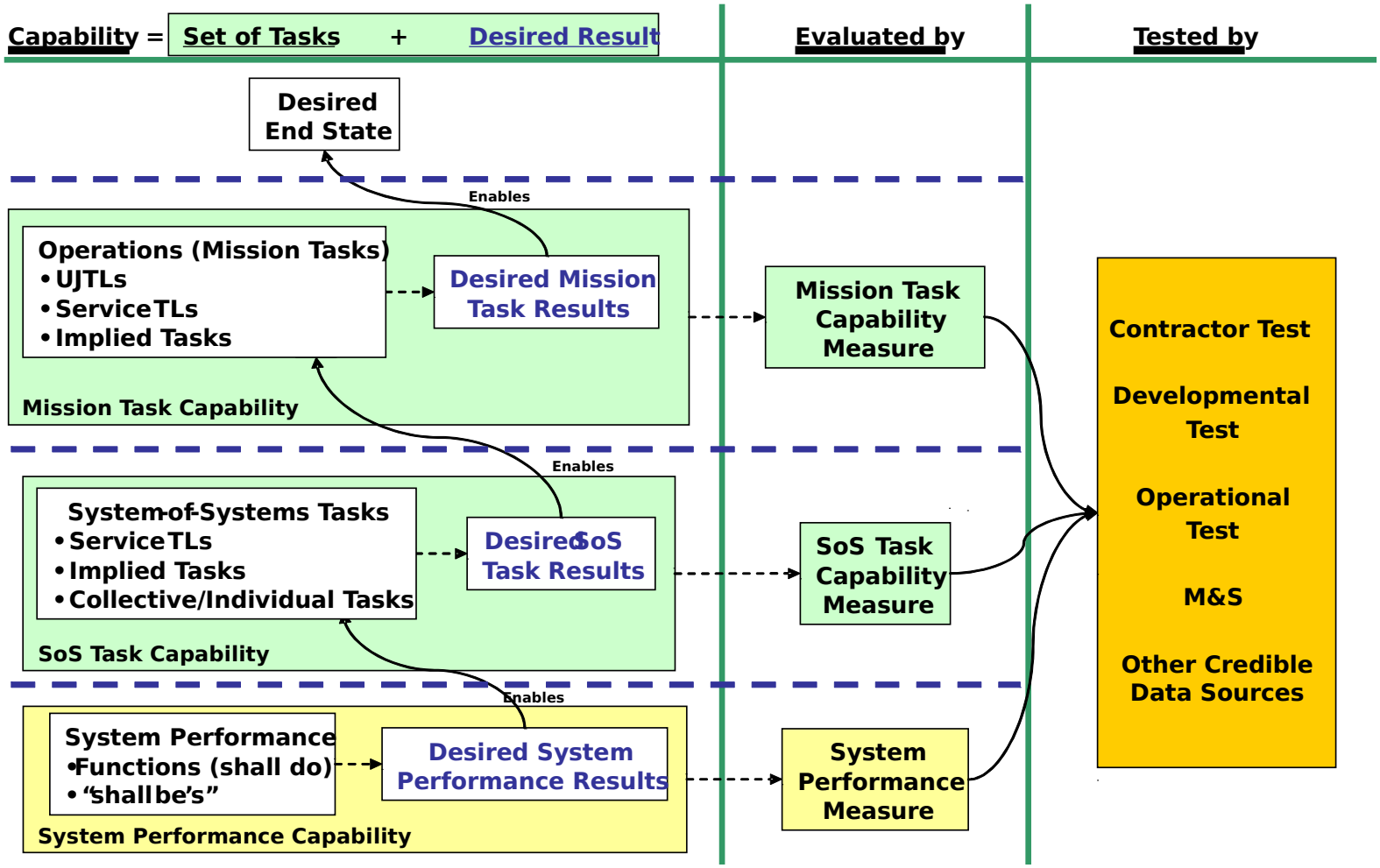
The Evaluator must have the lead.

Mission-Based Test & Evaluation

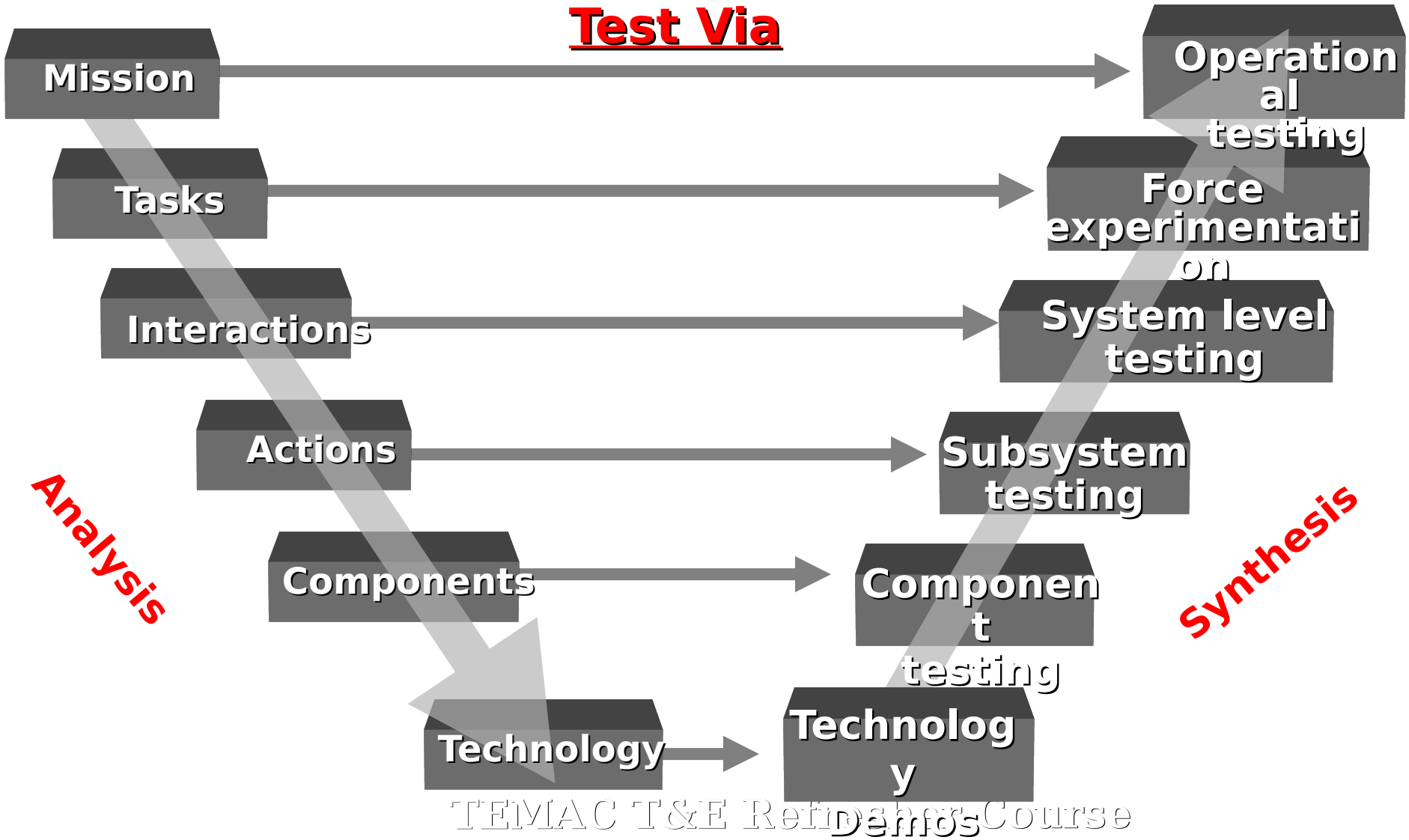
Definition: MBTE is a methodology that focuses T&E on the mission task capabilities provided to the warfighter. It provides a framework and procedure to:

- **link capabilities to the attributes of the materiel system-of-systems**
  - **develop evaluation measures that assess both capabilities and attributes**
  - **and link the evaluation measures to all available data sources**

MBT&E Framework



Analysis-Synthesis Model



Capabilities Analysis Products

- ***Lens Chart*** - Used to investigate evaluation functional areas at one more lens levels: Component, System, System of systems (SOS) or Family of systems (FOS) and Mission effectiveness
- ***Functional Work Breakdown Structure*** – Depicts the system functional areas to be evaluated
- ***Pattern of Analysis*** – Traces issues given in the SEP to the associated criteria, measures, data requirements and data elements
- ***System Data Model*** – Groups the data elements associated with the study of a system into normalized files and graphically represents the relationships of the normalized files

Identifying Factors & Conditions

- Factors and Conditions are the expected Test Conditions under which system performance measurements will be made. They constitute the variables affecting system performance.

Factors & Conditions are Variables for the Experimental Design.

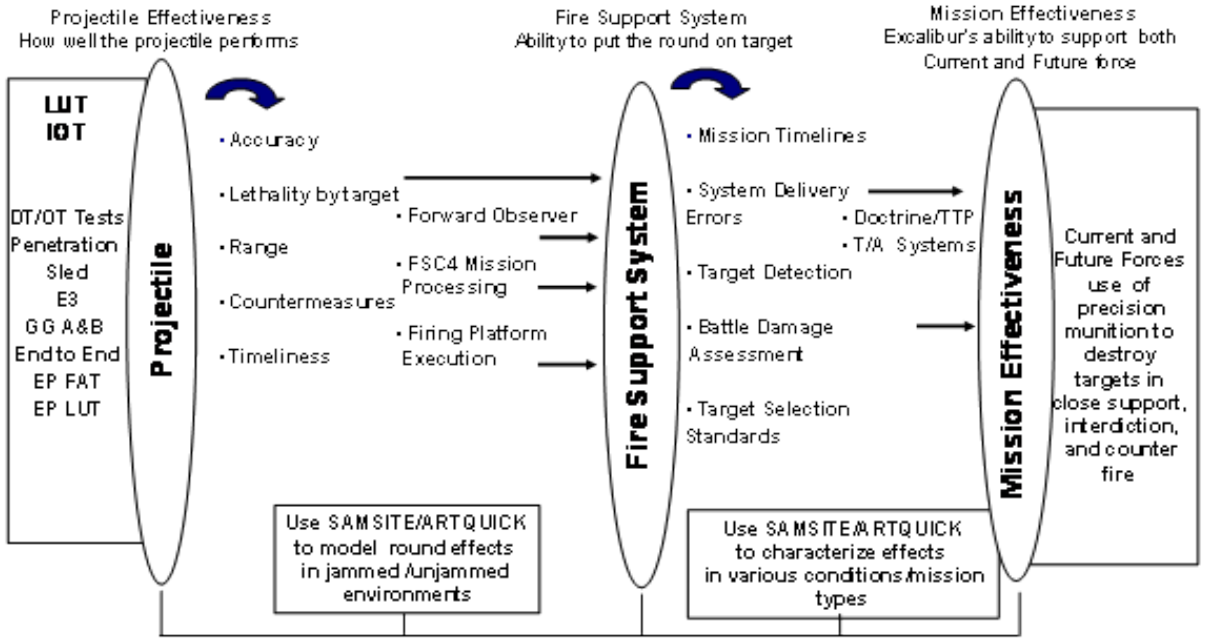
FACTORS		CONDITIONS
Light	SV	Day, Night
Terrain, e.g., Topography	SV	Flat, Rolling, Mountain
Meteorological, e.g., Precipitation	U	Dry, Rain, Snow
Meteorological, e.g., Visibility	U	Clear, Clouds
EW Environment	SV	Benign, EW IAW Threat Support Package
MOPP Level	SV	0 – IV
Target Type	SV	e.g., BMP, Tank; Fixed Wing, Rotary Wing
Target Range	SV	Each Range (e.g., 500, 900, & 1300 m)
Target Mode	SV	Moving, Stationary

SV = Systematically Varied
U = Uncontrolled

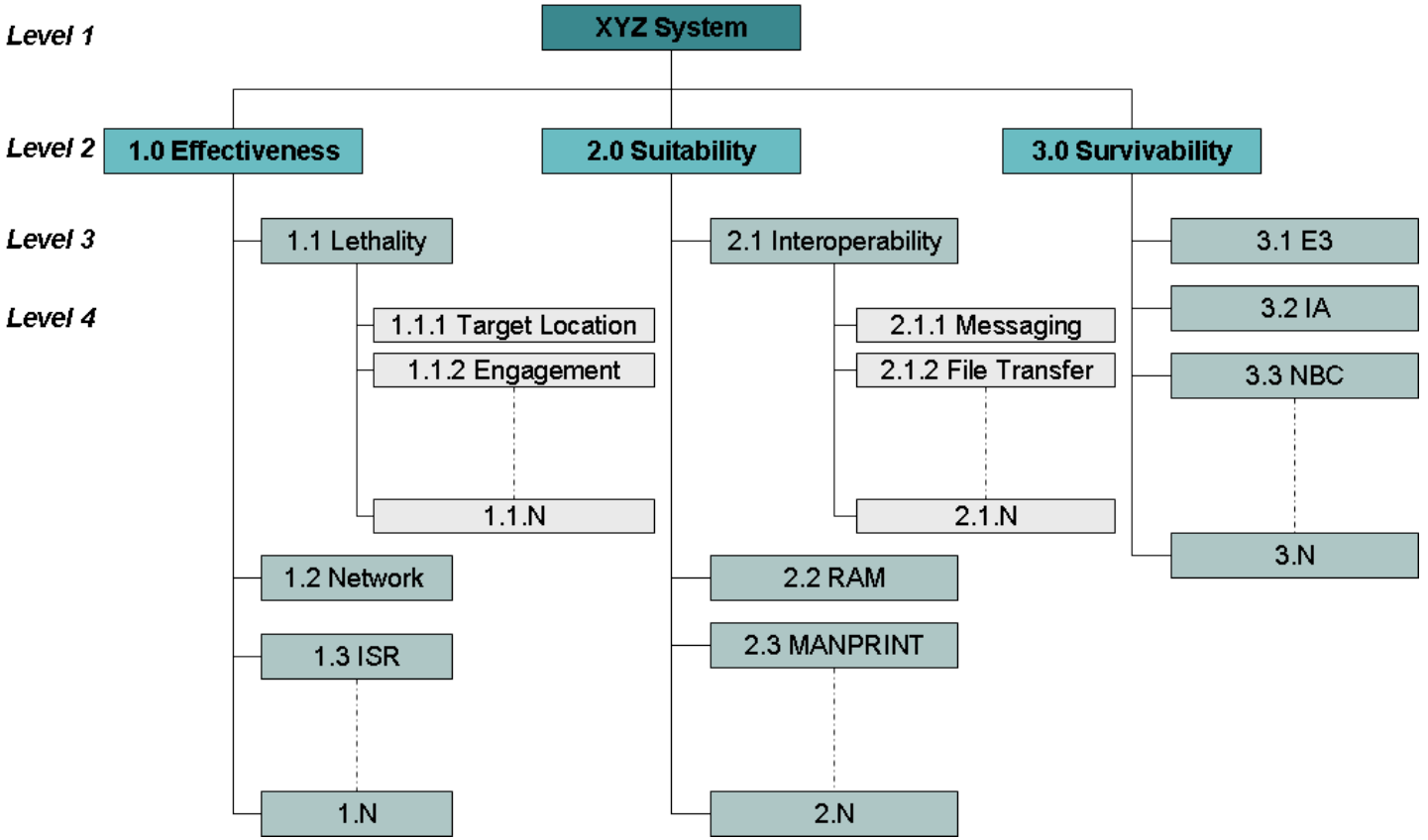
Lens Chart

- **<u>Definition of the Lens Chart</u>**: A grouping of measures into 3 or 4 categories where the categories are separated by drawings of optical lenses.
  - Categories include Component, System Functionality, Interoperability (Net-Ready), and Mission Accomplishment.
- Requires defining measures differently at different levels

Depicts different levels of measurements.



Functional Dendritic



Helps track Evaluation measures and trace the relationship between measures.

Pattern of Analysis

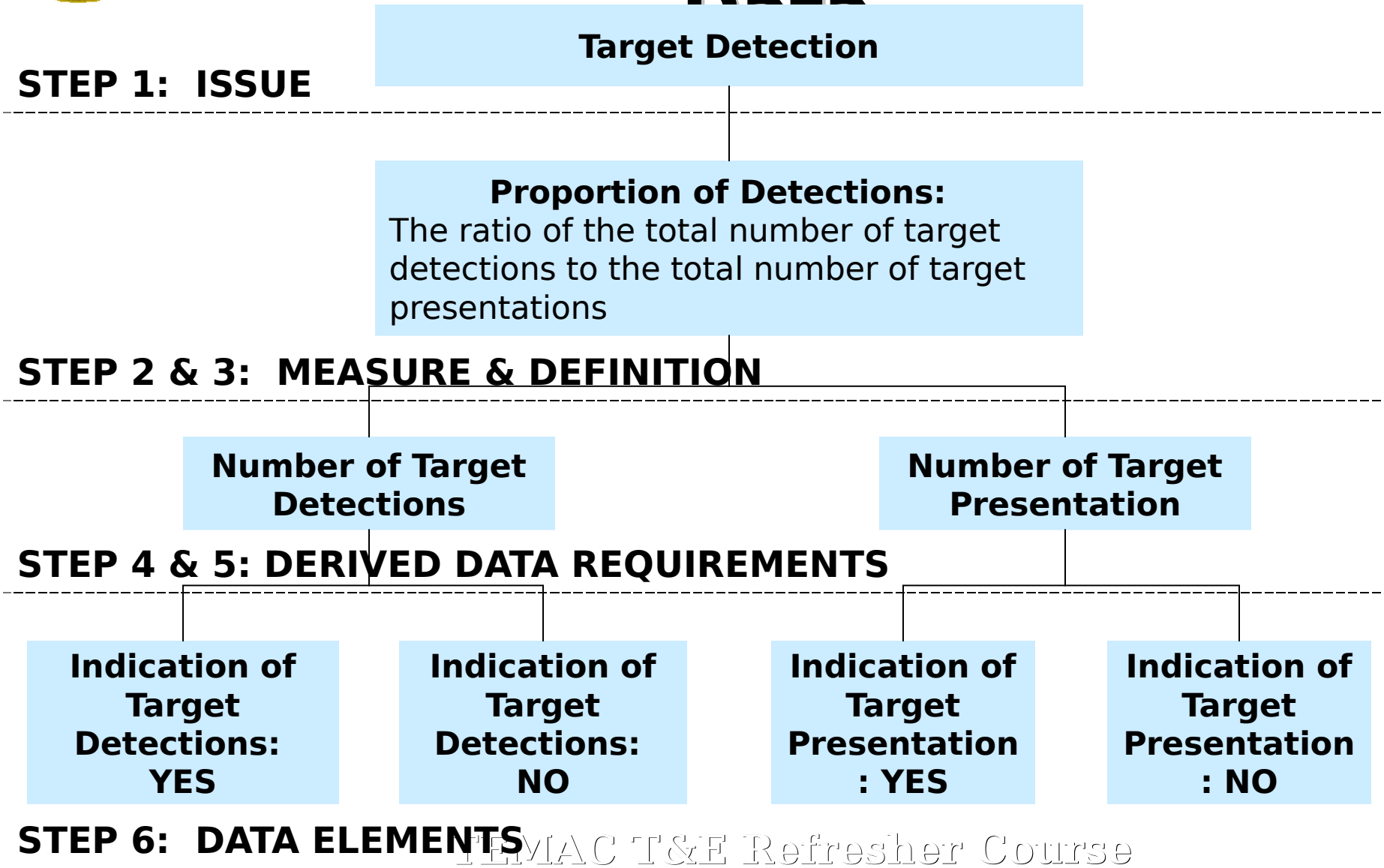
Definition of Pattern of Analysis: A table showing the data elements relevant to the issues and measures addressed in the course of evaluating a system.

BENEFIT OF THE PATTERN OF ANALYSIS

The PA formalizes a process for identifying data requirements and provides traceability between T&E issues given in the SEP to their associated criteria, measures, derived data requirements and data elements

1. Identify an issue
2. Identify the measures
3. Define the measure
4. Identify the derived data requirements
5. Define the primary data requirements (data elements)
6. List the data elements for the measure and issue.

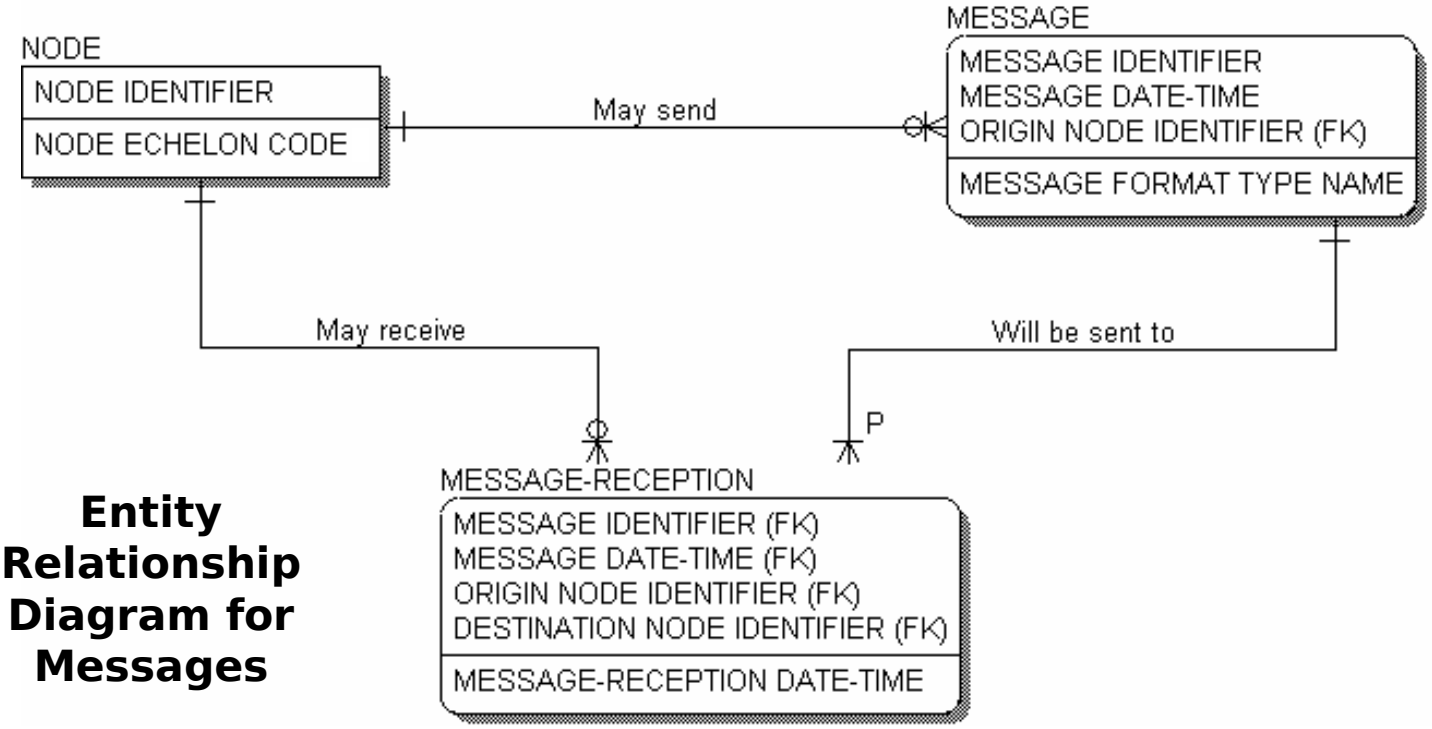
Example of a Pattern of Analysis with Qualitative Data


Target Detection
STEP 1: ISSUE
Proportion of Detections:
The ratio of the total number of target detections to the total number of target presentations
STEP 2 & 3: MEASURE & DEFINITION
Number of Target Detections
Number of Target Presentation
STEP 4 & 5: DERIVED DATA REQUIREMENTS
Indication of Target Detections: YES
Indication of Target Detections: NO
Indication of Target Presentation : YES
Indication of Target Presentation : NO
STEP 6: DATA ELEMENTS

The System Data Model

What Is a Data Model?

- ***Definition of a data model:*** A grouping of data elements into normalized files that describe a system, organization, or enterprise, where the relationships among files are graphically depicted, and where the data elements and files are defined in a data dictionary.



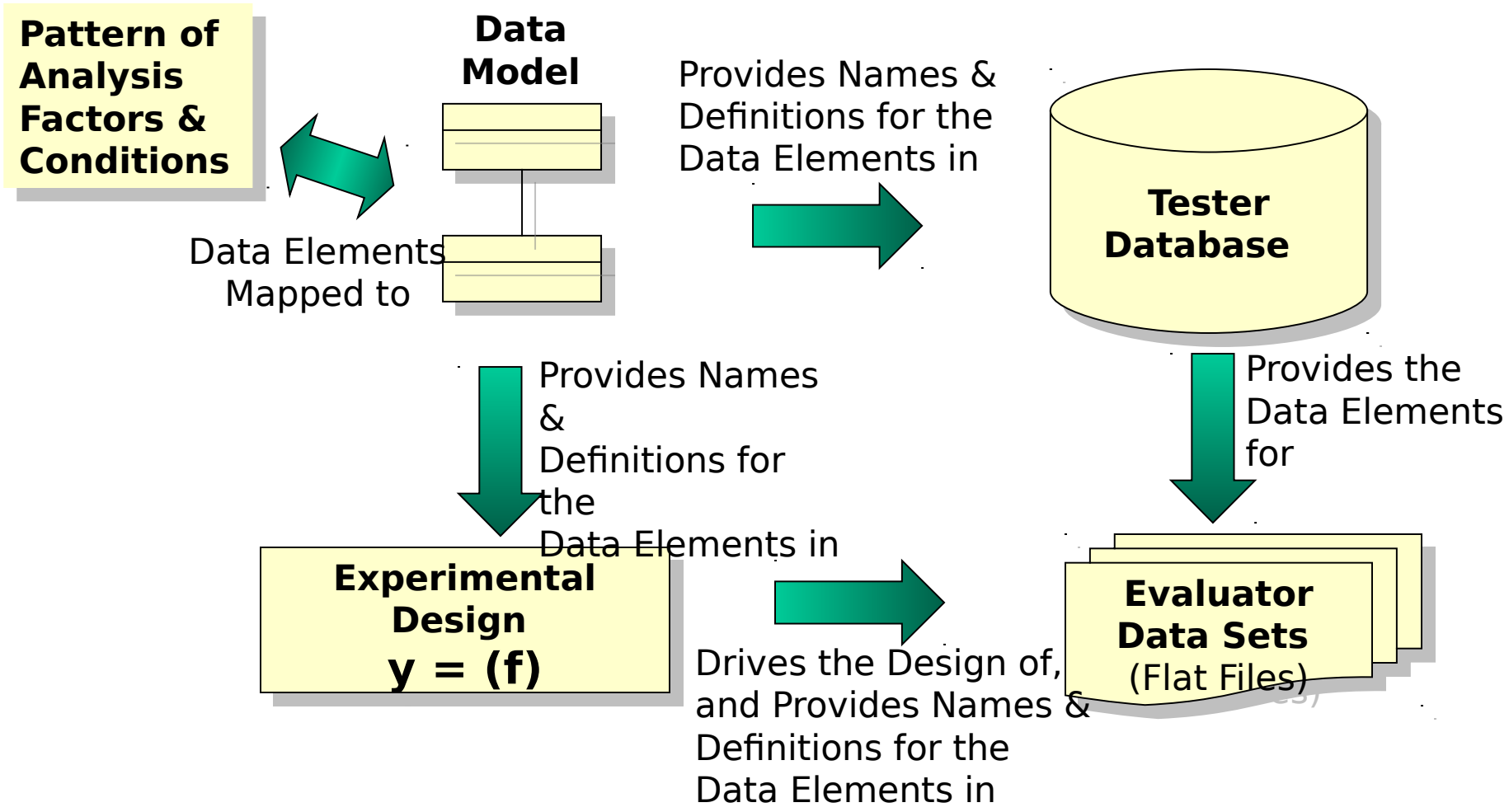
Entity Relationship Diagram for Messages

Data Model provides the discipline to document data.

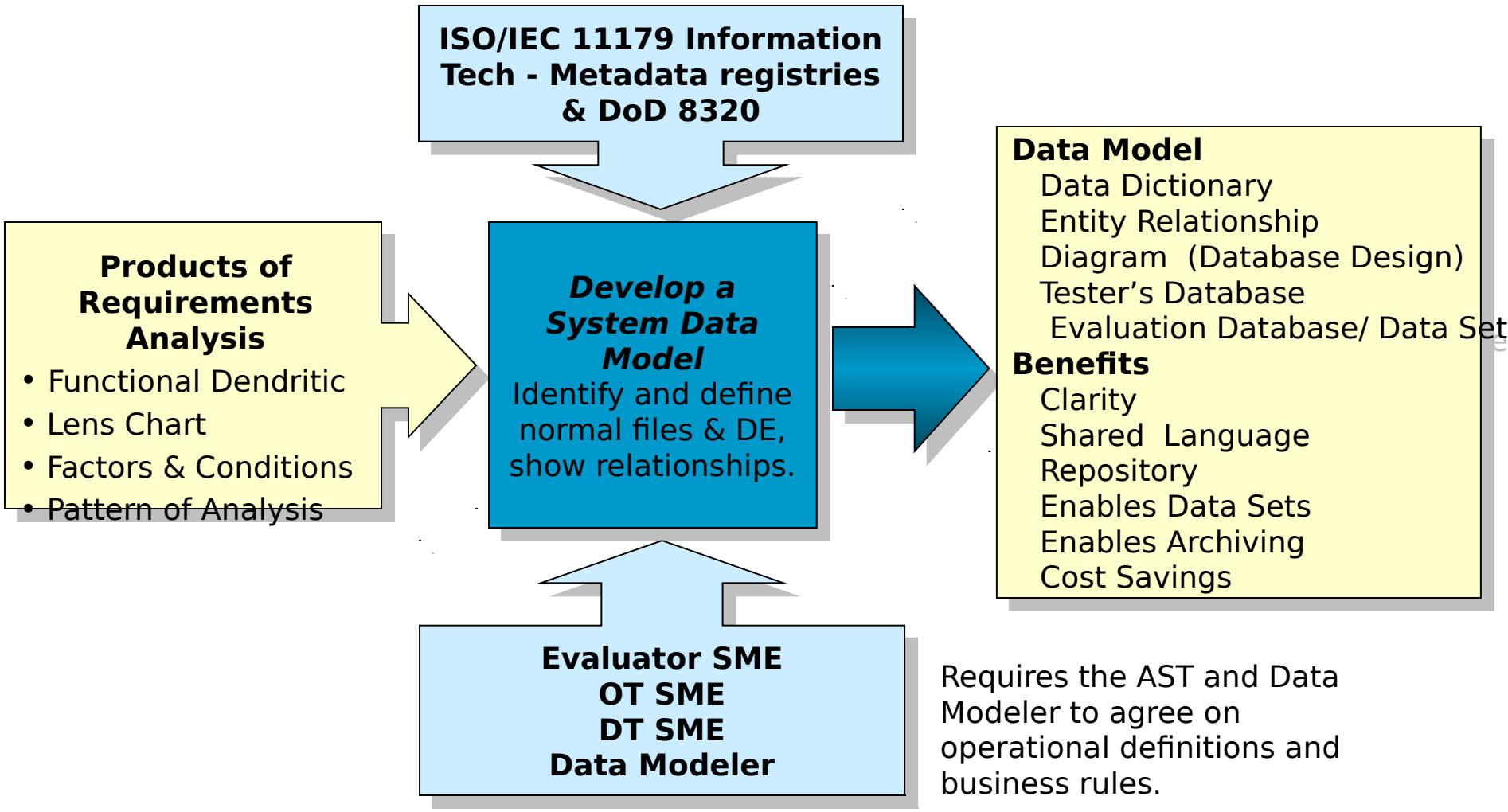
Data Modeling

- Clarify what your tables are all about
- Serve as permanent repositories from which data elements are drawn to create files for analyzing data produced at specific test events
- Provide a common language and facilitate the derivation of data requirements
- Help to identify independent and dependent variables for experimental designs
- Provide the documentation necessary for archiving data. They make data reusable.
- Facilitates an understanding of files and data elements, clarity. Today we do not define files, and often do not define data elements.
- Facilitates creation of data sets. Enables data analysis.
- Enables data archiving and reuse. Without documentation, data have a short shelf life.

How Do You Use a Data Model?


Pattern of Analysis Factors & Conditions
Data Model
Data Elements Mapped to
Provides Names & Definitions for the Data Elements in
Tester Database
Provides Names & Definitions for the Data Elements in
Experimental Design
y = (f)
Drives the Design of, and Provides Names & Definitions for the Data Elements in
Provides the Data Elements for
Evaluator Data Sets
(Flat Files)

How is the System under Test Data Model Created?



Requires the AST and Data Modeler to agree on operational definitions and business rules.

Experimental Design and the Analysis of Data

Experimental Design and Analysis

3 Key Concepts

1) **Experiment** - A controlled event in which the experimenter manipulates Independent Variables and observes the effects on Dependent Variables. (Vice waiting for things to happen.) Experiments isolate the effects of variables on other variables.
2) **Measurement -** Measurement is the systematic assignment of numbers or labels to the properties or characteristics of objects or events. A collection of measurements is called data.
3) **Analysis: T**he process of conducting statistical tests of hypotheses about the effect of one or more Independent Variables on a Dependent Variable.

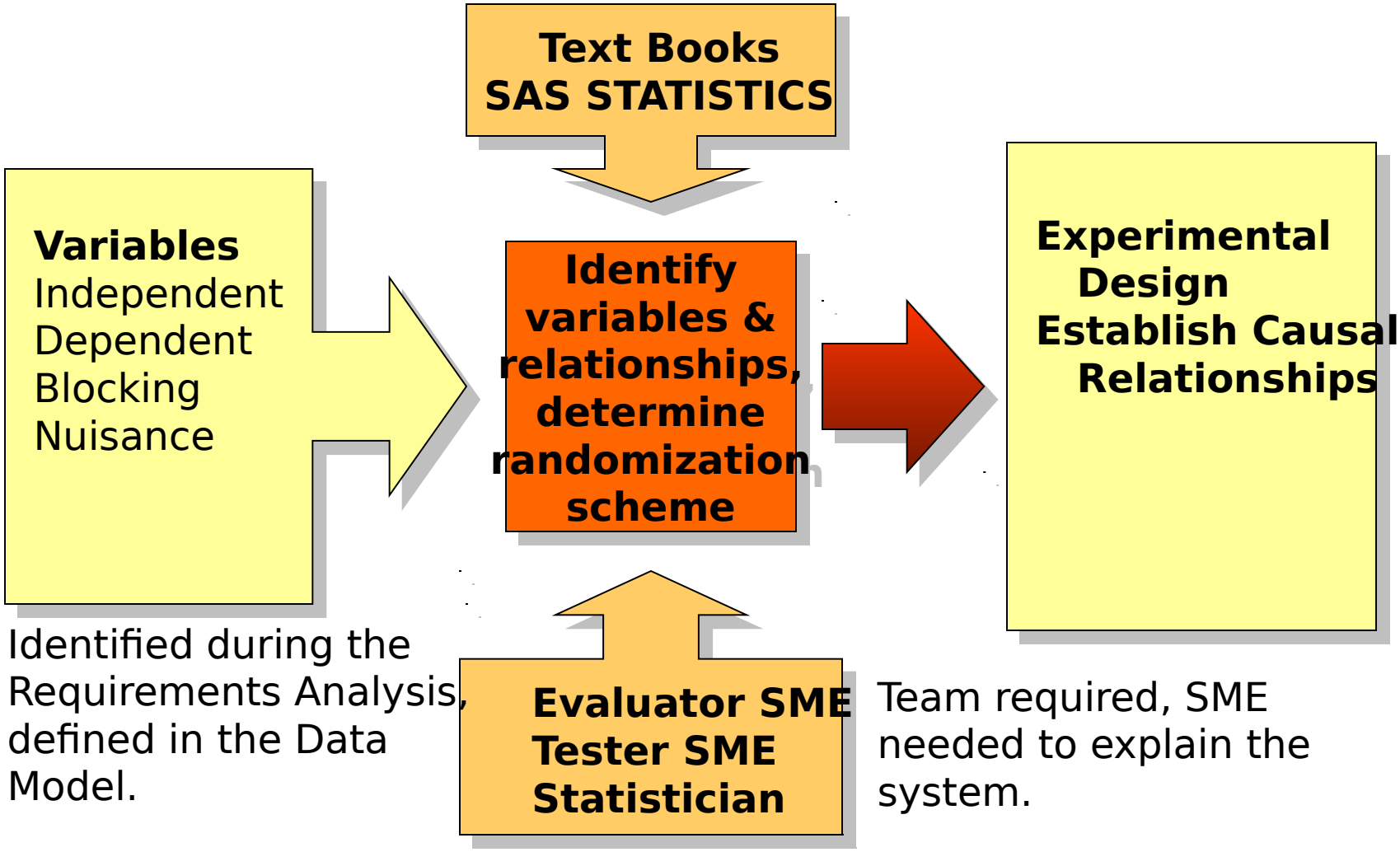
Experiments Answer Questions!

Tabular Representation of an Experimental Design

- Issue: An investigator wants to determine the effect of jamming on the ability of radar to detect fixed wing and rotary wing aircraft.
  - Independent variables:
    - Environment (Benign, Electronic Warfare)
    - Aircraft (Fixed Wing, Rotary Wing)
  - Dependent Variable:
    - Detect (Yes, No)
  - Design: Completely Randomized Crossed Factorial
  - Analysis: Two-way (2X2) ANOVA

		Environment	
		Benign	**Electronic Warfare**
Aircraft	**Fixed Wing**	B/FW	EW/FW
	Rotary Wing	B/RW	EW/RW

How Is an Experimental Design Created?

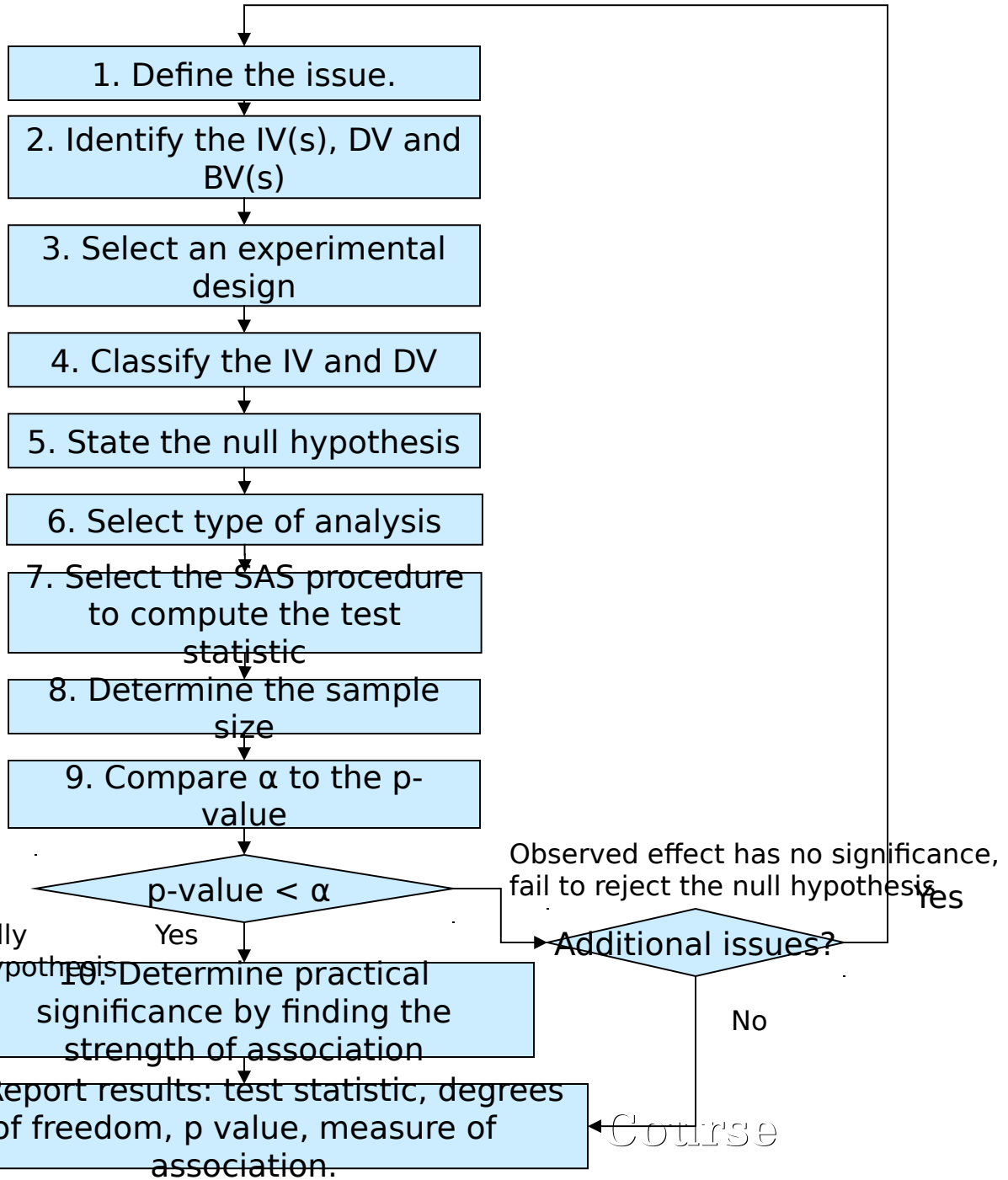


What Is a Data Analysis?

- ***Definition of Data Analysis:*** The process of using numerical procedures used to describe samples and make inferences about populations.
  - Descriptive Statistics
  - Inferential Statistics: Statistical tests of hypotheses about the effects of one or more independent variables
- Address Evaluation Issues
  - To answers questions about system's Effectiveness, Suitability, Survivability, and Mission Capability
  - To assess Statistical Significance
    - Likelihood of the Test Statistic
  - To assess Practical Significance
    - Strength of Association
    - Military Judgment
      - In comparison to what we had before, is there value added?

Hypothesis Testing

Steps in Designing An Experiment and Hypothesis Testing


1. Define the issue.
2. Identify the IV(s), DV and BV(s)
3. Select an experimental design
4. Classify the IV and DV
5. State the null hypothesis
6. Select type of analysis
7. Select the SAS procedure to compute the test statistic
8. Determine the sample size
9. Compare α to the p-value
p-value < α
Yes
Observed effect is statistically significant, reject the null hypothesis
Observed effect has no significance, fail to reject the null hypothesis
Yes
Additional issues?
No
10. Determine practical significance by finding the strength of association
11. Report results: test statistic, degrees of freedom, p value, measure of association.

Course

Data Sets

What is a Data Set?

- Evaluation Data Sets are:
  - Created for a specific event
  - Populated with data from the data producer's Test Database
  - Used by the AST for analysis purposes
  - Developed as needed to address evaluation issues such as satisfying the commander's intelligence, targeting and interoperability requirements

Example: Target-Firing Data Set				
	Variables			
Observations	Group	Range	Mode	Result
	1	Near	Stationary	Miss
	1	Near	Stationary	Hit
	1	Near	Moving	Miss
	1	Near	Moving	Miss

Why Design a Data Set?

- Data sets are designed to answer questions.
  - The questions uncovered during the capabilities analysis.
    - Addressed using an experimental design and statistical tests.
  - Questions about how a system performs under one or more specific test conditions.
    - Statistical tests are performed to determine if system performance was constant under the different

The content of a data set is ***crucial***. It must contain the data elements that are necessary to answer questions.

What Goes Into a Data Set?

- **Content of a data set is largely determined by the experimental design.**
- **An experiment is a structured or controlled situation designed to answer questions uncovered during the requirements analysis.**
- **Effects of the test conditions on system performance are assessed using a statistical test.**
- **In order to perform a statistical test, all the data elements necessary to perform that test must be in a single file.**

Data Element Definition Methodology

1. Define the data element
2. Categorize the data element
3. Center the definition of the data element on the class word
4. Define “what” the element is.

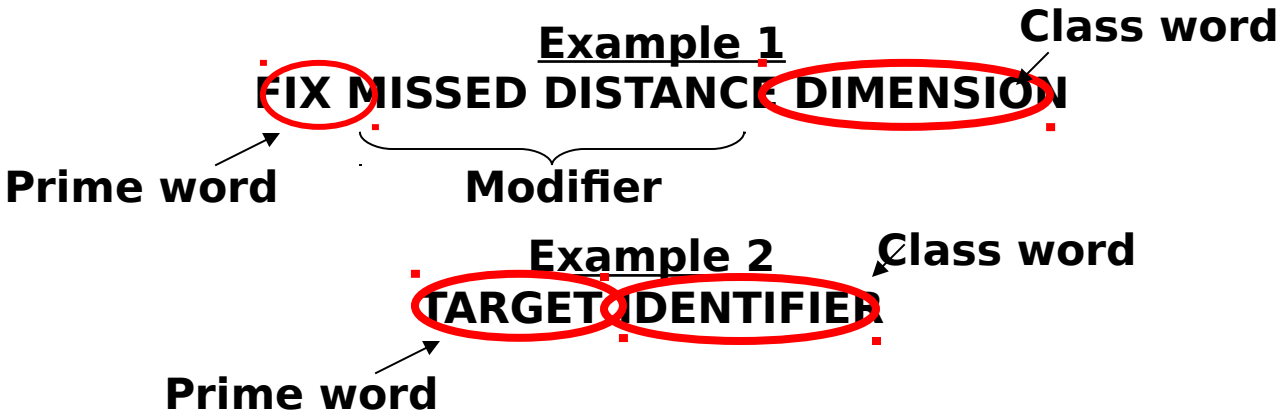
Data Element Definition Methodology

1. Define the data element in terms of the normalized file definition of the normalized file in which the data element is found (or would be found if the data were normalized).
2. Categorize the data element using a set of DoD standard “class” words
3. Center the definition of the data element on the class word.
4. Define “what” the element is, not “how”, “when”, or “where” it is used.

NOTE: The definition must be more than just a reiteration of the data element name.

Naming Data Elements

- Data elements are named in the same way they are defined – in terms of a normalized file in which they reside. A data element name consists of two or three parts as follows:
  - **Prime word (first part of the data element name):** The name of a normalized file in which the data element resides. That is, the name of the object or event that the data element is describing.
  - **Modifier (middle part of the data element name):** Optional, but is almost always necessary. It describes what is being described about the object or event.
  - **Class word (Last in a data element name):** Categorizes the data element. In some cases it can also act as a modifier, eliminating the need for the modifier.



Class Words

- **Class words:** Categories to which data elements can be assigned. *Note: A data element is assigned to **one and only one** category.*

  - **Quantitative class words:** Amount, angle, area, coordinate, dimension, mass, quantity, rate, temperature, volume, and weight.

  - **Qualitative class words:** Code, date, identifier, name, text, and time.

Example of Data Element Definitions

- **“**Target-Firing” file is defined as “A firing on a target by a specific crew at a specific point in time.”
- “Target-Firing Mode Code” data element could be defined in several ways, some much better than others.
  - *Definition 1:* The code that indicates the mode of the target.
    - *Critique:* It provides a class word, code, but is merely a restatement of the data element name
  - *Definition 2:* The code that indicates the movement status of the target.
    - *Critique:* It adds meaning to the name by indicating what the data element is (i.e., a movement status) but does not completely reference the file.
  - *Definition 3:* The code that indicates the movement status of the target at the precise time of firing.
    - *Critique:* It completes the definition by defining the data element in terms of the file definition (i.e., adds additional critical information “at the precise time of firing”).

DEVELOPED for Training Purposes

Data Element Names & Definitions Examples

- **Fix Missed Distance Dimension:** The dimension indicating the difference between the ground truth location of the target emitter and the electronically calculated location of the emitter measured in meters.
- **Target-Firing Range Dimension:** The dimension indicating the distance of the target in meters from the crew at the exact time of the firing.
- **Target-Nomination Assigned Weapon Name:** The nomenclature of the weapon assigned to a target during nomination of that target.
- **LOB Time:** The exact local time in hours, minutes, seconds, and milliseconds when a line-of-bearing was calculated by a specific sensor platform.

Planning and Reporting

SEP and OER

System Evaluation Plan (SEP)

- SEP is the documentation of the ESR and CIPR
  - Prepared by the AST
  - Describes the System and the Mission Context
  - Describes the Capability-Based Evaluation Strategy approved at the Early Strategy Review
  - Describes what information will be collected and how it will be used
  - Describes the Test/Simulation Event Execution Strategy approved at the Concept In Process Review (CIPR)
  - Provides the Data Source Matrix and System Level Enterprise Database
  - Provides the basis for input into the TEMP
- SEP Responsibilities
  - AST Chair has overall responsibility for development & approval
  - AST Members staff with their chains of command
  - For oversight systems, CG, ATEC signs after T&E WIPT coordination; for non-oversight systems, the CG's designee signs

Priority Evaluation Measures

- For Each Type of Capability (Mission, Warfighting, and System)
  - Describe the Capability
  - Describe the Expected Outcomes
  - Describe Measures for Each Outcome
  - Link Measures from System through Mission
  - Describe the Factors and Conditions for Each Measure
  - Annotate KPP, CTP, COIC, and IOT Entrance Criteria

Example of Data Source Matrix (DSM)

Mission System

EVALUATION FOCUS AREA	ISSUE	EVALUATION MEASURE	EVENTS						
			PQTC/G	LUT	PVT	AWE	FDT/E	IOT	M&S
Capability	Combat Multiplier ?	Measure 1-1 Force Exchange Ratio		S			S	S	P
ISR Warfighting Capability	Develop & Report on High Value Targets ?	Measure 2-1 Target Acquisition Rate Measure 2-2 Percent of Reported Targets Engaged	P	S S		S	S		P
Capability (Effectiveness)	Geometric Accuracy?	Measure 3-1 Target Location Error as a function of flight size	P		P				S
Sustainability (Reliability)	Demonstrate Reliability Requirement ?	Measure 4-1 Mean time between hardware failures	P	S	P				S

Legend :

P - Primary Source (Provides All Essential Data to Address the Evaluation Focus Areas)

S - Secondary Source (Supplemental or Acts as a Backup)

- Shows the contributions of each data source to the evaluation focus areas
- Enables proper scoping of the events
- Each evaluation measure must have at least one primary data source
- Annotate all COIC, KPP, CTP, and IOT entrance criteria

SEP & TEMP

- Relationship of SEP and TEMP
  - Develop in parallel.
  - Either can be approved first, as long as in synch.
  - SEP has one more level of detail than TEMP
- SEP-Updates
  - Should not be a routine thing. Only with significant changes (i.e. evaluation strategy, TEMP, requirements). Don't start from scratch.
  - SEP-U approval does not stop EDP development. Work evaluation requirements, update and negotiate with tester EDP

Tips for a Successful SEP

- Get involved early - understand the System, Mission, and Organization
- Create a Capability-Based Evaluation Strategy
- Write Evaluation Measures, Factors, and Conditions clearly so that they can be tested, measured, and analyzed
- Use System Evaluation Plan to document and expand the approved Evaluation Strategy

SEP and OER Formats

System Evaluation Plan (SEP)

- Chapter 1 Introduction
  - Purpose, System Description, Key Milestones
- Chapter 2 Evaluation Overview
  - Evaluation Strategy: Lens Chart (Requirements Analysis)
- Chapter 3 Evaluation Details
  - List Measures and COIC by Functional Area
- Chapter 4 Events
  - Describe Test Events (Data Sources)
- Appendices (DSM, COIC, and KPPs)

OTA Evaluation Report (OER)

- Chapter 1 Introduction
  - Purpose, Background, Scope of the Evaluation
- Chapter 2 Conclusions
  - Bottom Line (ESS), Arguments to Support the Bottom Line, Data to Support the Arguments (Descriptive Statistics)
- Chapter 3 Evaluation Details
  - Results by measure. (Observations and Descriptive Statistics)
  - May use same format as in SEP, Chapter 3
- Chapter 4 Recommendations
  - Improvements to the System, Modifications to the T&E Strategy
- Appendices as needed

AEC Recommended Generic SEP/ OER Format: Problem, Method, & Outcome

- **Introduction**
  - **Statement of Problem/Requirements Analysis**
    - **Can something do something under such and such**
    - **conditions?**
- **Method (Describe in sufficient detail to permit replication of test.)**
  - **Data Management**
    - **Data Model, Data Sets**
  - **Players**
    - **System users, operators, maintainers**
  - **Materials**
    - **Systems**
    - **Instrumentation, Data Collection Forms, & Questionnaires**
    - **Simulations and Stimulators**
  - **Experimental Design**
    - **Specification of Variables, Relationships, and Randomization Scheme**
  - **Procedures (for the Data Collection Phase)**
    - **Physical Implementation of the Experimental Design in Terms of Time Ordered Events**
- **Results and Discussion**
  - **State results, the Data Relevant to the Issues (ESS)**
    - **Descriptive Statistics**
    - **Inferential Statistics: State the results of statistical tests and provide probability levels.**
  - **Discuss results in terms of test conditions**
    - **Explain the results**

How Do You Produce a Plan or Report?

- Regardless of the prescribed format, ensure that you address the elements of the Generic Format.
  - Describe the problem, the method of resolving the problem, and the outcome.

Introduction (Problem), Method, Results and Discussion

SEP Format with Generic Content For Each Measure Provide …

- Chapter 3 Evaluation Details
  - Effectiveness
    - Functional Area 1 (e.g., Lethality) (COI 1, KPP 1)
      - Measure 1
        - » **Experimental Design and Statistical Techniques**
        - » **Scheme for how test conditions will-be-presented to the SUT**
        - » **Desired Sample Sizes based on Power Analysis**
      - Measure 2
      - Measure n
    - Functional Area 2 (e.g., Battle Command) (COI 2, KPP 2)
      - Measure 1
      - Measure 2
      - Measure n
    - Functional Area n

SER Format with Generic Content
For Each Measure Provide …

- Chapter 3 Evaluation Details
  - Effectiveness
    - Functional Area 1 (COI 1, KPP 1)
      - Measure 1
        - » Experimental design (e.g., Comparison to Baseline).
        - » Descriptive statistics, results of statistical tests, and probability levels.
        - » Discussion of system performance in terms of test conditions.
      - Measure 2
      - Measure n
    - Functional Area 2 (COI 2, KPP 2)
      - Measure 1
    - Functional Area n

Evaluation Take Aways

- Evaluation Planning needs to be completed ***early***
- Evaluation Strategy ***drives*** all T&E planning, resources, and execution
- Know what you want to evaluate and ***remain focused***
- Evaluation strategy must put the ***correct emphasis*** on System Development and Demonstration prior to Production and Deployment
- Evaluation execution ***must be continuous***
- Evaluation results ***must be objective and unbiased***

Acknowledgement & Feedback

This module is a part of the T&E Managers Committee (TEMAC) T&E Refresher Course.

Request your feedback. Please contact -

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